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NASA TO LAUNCH
SEVENTH SATURN I
IN APOLLO TEST

The National Aeronautics and Space Administration will launch the seventh Saturn I vehicle from Cape Kennedy, Fla. no earlier than Sept. 17. The vehicle is known as SA-7.

The Saturn vehicle has minor changes but the spacecraft and flight plan are similar to the SA-6, which was launched successfully May 28, 1964.

"Boilerplate" versions of the Apollo spacecraft command and service modules attached to the Saturn second stage and instrument unit (vehicle guidance system), will be launched into a low Earth orbit of about three days duration.

Objectives of the flight are to further test the propulsion, structural, guidance and flight control systems of the two-stage Saturn I vehicle; further test the structure and design of the Apollo spacecraft during flight through the atmosphere; demonstrate physical compatibility of launch vehicle and spacecraft and test jettisoning of the spacecraft launch escape system.

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The flight plan calls for the 36,700-pound payload to be placed in an Earth orbit with a perigee of 115 statute miles, an apogee of 135 statute miles and a period of 88.4 minutes. This orbit closely approximates the "parking" orbit for later manned lunar exploration missions.

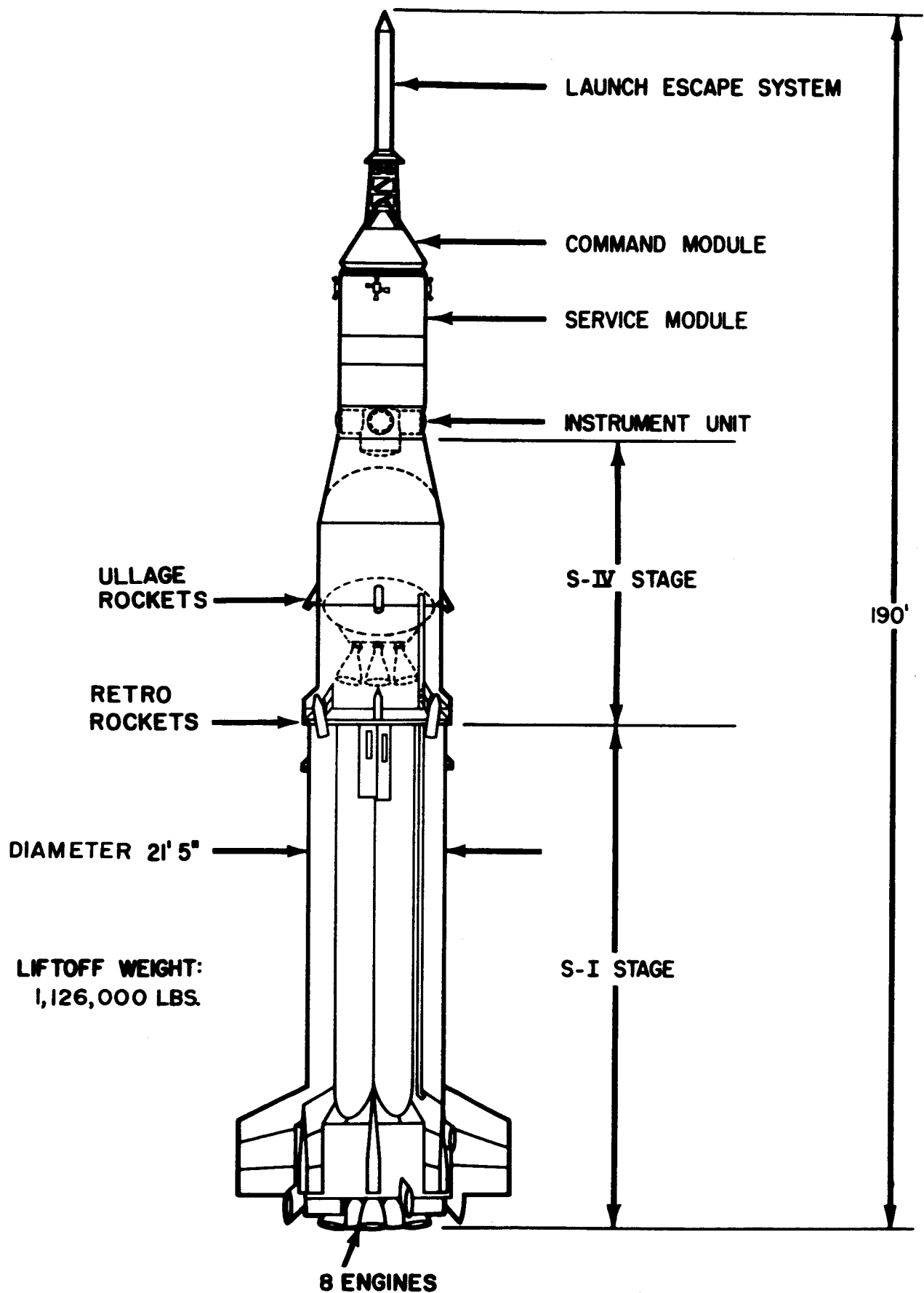
Three NASA centers are involved in this flight: Marshall Space Flight Center, Huntsville, Ala., vehicle developer; Manned Spacecraft Center, Houston, spacecraft developer; and Kennedy Space Center, Cocoa Beach, Fla., launching organization. All work is under the direction of the Associate Administrator for Manned Space Flight at NASA Headquarters. The three centers will be assisted in this flight by Chrysler Corp., Detroit; Douglas Aircraft Co., Santa Monica, Calif.; and North American Aviation, Inc., Downey, Calif.; principal contractors for the Saturn I first and second stages and the Apollo spacecraft, respectively.

The previous six Saturn I flights have been successful. Following SA-7, there remain three flights in this series, ending in mid-1965. All three remaining vehicles will carry large meteoroid detection satellites (called Pegasus) folded within a specially adapted Apollo service module. Once in orbit, the payload will be deployed to form a wing about 100 feet long and 14 feet wide, sweeping space to gather evidence of meteoric particles which pose some degree of hazard to manned spacecraft.

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BACKGROUND INFORMATION FOLLOWS

SATURN SA-7 VEHICLE



BACKGROUND INFORMATION

Vehicle Changes

Several relatively minor changes in the Saturn vehicle for this launch are:

1. The ST-12⁴ guidance system platform will be in complete control of the vehicle for the first time. The ST-12⁴ will determine the steering commands required to achieve orbital insertion. It was used on the SA-6 vehicle only during second stage burn.

2. Vehicle performance is improved by a change in the booster (S-1) cutoff system which leaves less propellant in tanks and plumbing following cutoff. Liquid level sensors are located near the bottom of four outer tanks--two liquid oxygen (LOX) and two fuel. When the propellant level lowers to any one of these sensors or probes, the cutoff sequence is initiated by the guidance computer. Two seconds later the four inboard engines are cut off. When the LOX pressure to any one of the remaining four engines drops below the present level, a signal is given by a pressure switch which cuts off the four remaining engines simultaneously. This cutoff should come about six seconds following inboard engine shutdown. This is called "LOX starvation" cutoff. On the SA-7 vehicle, the four liquid level sensors referred to earlier have been placed lower in the tanks, allowing a more complete propellant consumption. About 8,500 pounds of propellant is expected to remain in the tank sumps and propellant lines at cutoff, compared to about 14,000 -more-

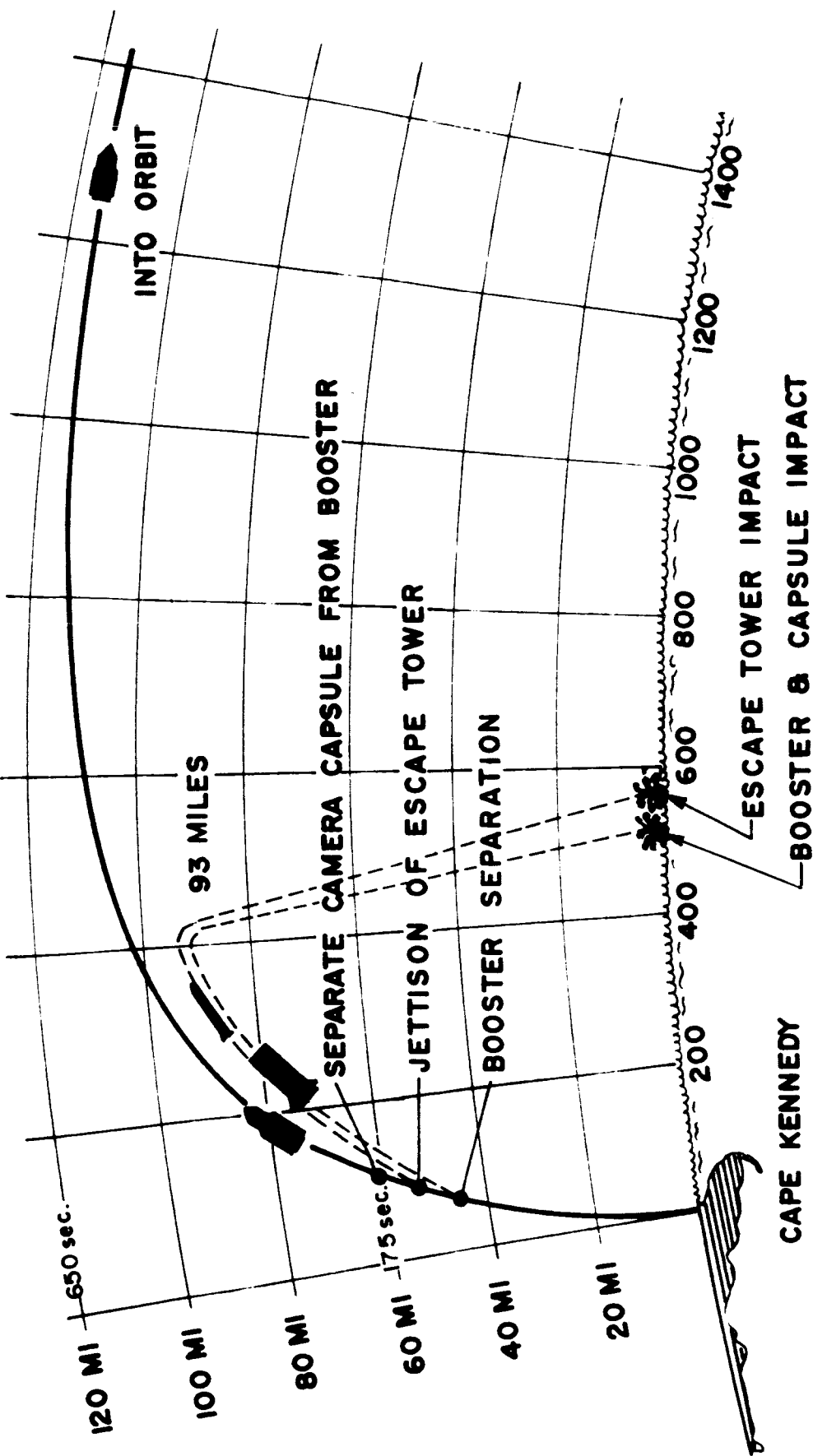
pounds on SA-6. The period between inboard and outboard engine cutoff was fixed at six seconds by an automatic timer on SA-6 without consideration of the amount of LOX remaining in the system.

3. Changes have been made to the second stage (S-IV) propellant venting system which will reduce the payload's spin and tumble rate in orbit. Previously, liquid hydrogen and liquid oxygen residuals have vaporized during orbit and escaped through a single vent in each system. In the vacuum of space, this venting has had a minor propulsive effect. It induced in-orbit roll rates which would be detrimental to the large-wingspan meteoroid satellites which are to fly later on Saturn I. So non-propulsive venting systems have been devised. LOX and liquid hydrogen (LH₂) will each have two vents, located 180 degrees apart, which should eliminate these unwanted motions.

4. The eight H-1 engines in the booster use for the first time an improved gear box, known as the Mark III H, and improved liquid oxygen domes.

5. On the two previous S-IV flights, extra helium was carried as a backup to the helium heater system which provides the gas used to pressurize the LOX tank. The helium heater has worked satisfactorily; therefore a backup system consisting of extra storage bottles weighing 1,000 pounds has been eliminated.

SA-7 TRAJECTORY



Flight Sequence--At ignition, the 190-foot tall vehicle will weigh 1,140,000 pounds. Hold-down arms at the launch pedestal will release the rocket after assurance is given that all engines are operating properly. Liftoff usually takes place about three seconds after ignition. During this period some 14,000 pounds of propellant are consumed, giving the vehicle a liftoff weight of 1,126,000 pounds.

SA-7 will be launched on an azimuth of 90 degrees. After 11 seconds of flight, it will begin to roll into its flight azimuth of 105 degrees at a rate of one degree per second. Shortly thereafter, the vehicle tilt program begins. The ST-124 stabilized platform controls the roll and tilt programs simultaneously. On SA-5 and 6, these functions were performed by the ST-90 platform in sequence.

After liftoff the following significant steps occur:

T+11 seconds--initiate roll

T+12 seconds--initiate tilt

T+25 seconds--terminate role

T+70--vehicle passes through region of maximum dynamic pressure (Altitude, 2.7 miles; range, 7.8 miles).

T+107--S-IV engine hydrogen prestart flow begins.

T+134--S-I propellant level switches (which will sense a low level of propellant, initiate the LOX prestart flow in the S-IV stage and S-I inboard/cut off engine) are armed.

T+136--Tilt program is arrested, with vehicle at 67 degree angle from launch vertical.

T+141--Inboard engine cutoff.

T+147 to 149--In succession, S-I outboard engines cutoff, S-IV ullage rockets fire, booster separates followed by S-I retro rockets firing, S-IV engines ignite (Altitude, 45 miles; range 57 miles.)

T+160--Jettison S-IV ullage rocket casings and Apollo launch escape system tower.

T+165--Initiate path-adaptive guidance.

T+172--Eject camera capsules from booster.

T+620--End powered flight by guidance system-initiated cutoff, followed by insertion into orbit.

The orbital insertion point will be about 1,300 statute miles downrange from the launch site at 115 miles altitude. The vehicle will be traveling at some 16,500 miles per hour.

The Satellite--The portion of the vehicle to be orbited is 80 feet long, consisting of the Apollo command and service modules, instrument unit and S-IV stage. There will be no separation of these units and no attempt at recovery. Preliminary weights of these units are as follows, although they are subject to slight change:

Spent S-IV stage-----14,100 pounds

Instrument Unit-----5,400

Payload (command
module, service module,
insert/adaptor, ballast)-----17,200

Total-----36,700

In addition there will be about 2,000 pounds of propellant left in the S-IV stage. This residual fuel will gradually evaporate.

The orbit is expected to have a perigee of 115 statute miles, an apogee of 135 statute miles and a period of 88.4 minutes. Re-entry is expected at the end of the third day, as did the SA-6 payload.

A minitrack transmitter in the instrument unit will be operating on a frequency of 136.995 m.c. The system has one battery which should assure operation for the lifetime of the satellite. Sufficient battery power is available to operate the vehicle and Apollo telemetry and tracking systems through one orbit.

Tracking Network--SA-7 tracking and data acquisition facilities include parts of the Manned Space Flight Network and the STADAN (Satellite Tracking and Data Acquisition Network), supported by the SAO (Smithsonian Astrophysical Observatory) Network and stations of the Department of Defense in the U.S. and the Atlantic and Pacific Oceans.

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The SAO network will use Baker-Nunn cameras. Manned space flight network stations will record telemetry for one orbit and "skin-track" with C-band and S-band radar. The precount, countdown and first two orbits will be treated in a manner similar to manned missions with the network under the control of Goddard Space Flight Center.

Radar data will be transmitted instantly to Goddard. Standard station-to-station voice communications network will be used.

Telemetry--SA-7 will transmit to ground stations about 1,378 measurements, as follows: S-I stage, 661; S-IV 397; instrument unit, 187; and Apollo spacecraft, 133. This is about 70 more than SA-6, and is the largest number taken from a U.S. space vehicle. In addition to flight measurements, more than 200 "blockhouse measurements" are to be received in the launch control center during countdown.

The rocket has 13 flight telemetry systems: six on the S-I, three on the S-IV and four in the instrument unit. The spacecraft has three.

The telemetry systems transmit such measurements as engine turbine temperature and propellant pump rpm; positions of valves, temperature of engine bearings, heat exchanger outlets, structure, turbine exhaust and nitrogen pressurization tanks and payload; pressures in combustion chambers, propellant tanks and payload; strain and vibration throughout the vehicle; vehicle position; velocity; motion of control actuators; propellant level; battery voltages and currents; inverter frequency, etc.

Optical Systems--The SA-7 booster will carry eight motion picture cameras and one television camera. These cameras will view the interiors of two oxygen tanks, S-IV stage separation, retro-rocket firing and S-IV stage ullage rocket and propulsion system operation. All motion picture cameras are in capsules which are mounted at the top of the S-I and slanted outward for ejection. All will carry color film except the one viewing the interior of the center LOX tank. Three outside-view cameras will operate from about 40 seconds before until about 20 seconds after S-I/S-IV separation. A fourth outside-view camera will start at the same time but continue to operate, battery-powered, after ejection and until the camera capsule strikes the ocean, about 530 miles down-range.

The two cameras viewing LOX tank interiors will start 25 seconds before separation. One, running 24 frames per second will run out of film shortly before separation. The second will run at 12 frames per second until separation. The other two cameras will run for 25 seconds, until separation, at 64 frames per second.

This is the third time such an elaborate system has been carried on a launch vehicle. The technique is used to gather all possible information from each launch in view of the few R & D firings scheduled. Cameras provide a visual record of events in several critical areas of the rocket, especially in the separation of the S-I and S-IV stages and in the ignition of S-IV engines.

The television camera will provide instantaneous visual information on the functioning of selected items, from liftoff until S-I impact, and a permanent visual record for future study and analysis. The TV camera will not be ejected. Images will be recorded on video tape at the ground monitoring station.

APOLLO SPACECRAFT

The SA-7 vehicle will carry a "boilerplate" model of the Apollo command and service modules, plus the insert/adaptor which is located beneath the service module. The total Apollo weight in orbit will be about 17,200 pounds, of which more than 2,800 pounds will be lead ballast. Principal contractor for the command and service modules is North American Aviation's Space and Information Systems Division, Downey, Calif.

The launch escape subsystem, to be jettisoned during S-IV powered flight, weighs about three tons.

The launch escape subsystem, for this mission consists of three live motors (pitch-control, launch-escape and tower-jettison), nozzle skirt, spacecraft escape tower with separation mechanism, and necessary instrumentation sensors and wiring. Mounted within the nose is a "Q-ball," a dynamic pressure sensor used to measure the angle of the vehicle in flight. The launch escape and pitch control motors are produced by Lockheed Propulsion Co., Redlands, Calif.

Pitch Control Motor--The pitch control motor is a solid-propellant motor providing 2,800 pounds of thrust for $\frac{1}{2}$ second. It is nine inches in diameter, 22 inches long, and weighs about 50 pounds.

Tower Jettison Motor--The tower jettison motor is a solid propellant motor 26 inches in diameter and 47 inches long. No igniters will be installed for this mission.

Launch Escape Motor--The launch escape motor is a solid-fuel motor 26 inches in diameter, 185 inches long and weighs more than 4,700 pounds. Four fixed exhaust nozzles are canted to minimize jet blast on the command module. Thrust is 155,000 pounds with an approximate burning time of eight seconds.

Tower Structure - The tower structure is composed of welded tubular titanium alloy with a truncated rectangular cross-section. It is 120 inches long with a base 46 by 50 inches. The tower forms the intermediate structure between the command module and escape motor. A structural skirt is used to attach the escape motor to the tower which will be covered with an ablative material.

Tower Separation Subsystem - The launch escape tower separation subsystem consists of explosive bolts in each of four tower legs. In addition to the conventional internal explosive charge, an independent linear shaped charge is provided at a flattened section on each bolt. Each charge is triggered by a separate initiator.

Command Module - The Boilerplate 15 command module to be used in the SA-7 mission simulates the size, weight, structure and center of gravity of the spacecraft which will be used on manned missions at a later date. It is an aluminum structure covered with cork insulation material to protect the structure from overheating.

Crew Compartment - The boilerplate compartment uses frame stiffeners of the exterior shell structure to attach mountings for instruments, electrical power system and ballast required to maintain proper weight and center of gravity. Also included are a main hatch (aluminum alloy structure) bolted to the command module structure for access to the compartment shell, and a forward access way (tubular structure of aluminum) welded to the forward bulkhead. This access is provided with a bolted-on cover.

Aft Heat Shield - The boilerplate heat shield is similar in shape to the operational heat shield. It is composed of an inner and outer layer of laminated glass over an aluminum honeycomb core and attached to the command module by four struts.

Forward Compartment Cover - On the SA-7 mission, this is a sheet metal fabricated cover and fiberglass honeycomb radome assembled together. The assembly is bolted to the command module.

Communications and Instrumentation Subsystems - 133 measurements will be telemetered to ground stations from the spacecraft.

Environmental Control Subsystem - The spacecraft cooling system provides air in a continuous flow to maintain command module inside temperature at 80 degrees F., plus or minus 10 degrees. The system consists of a storage tank, pump, cold plates, heat exchanger, fan thermal control valves, and quick disconnect valves. Power is supplied by the electrical power subsystem.

Electrical Power Subsystem - The spacecraft electrical power subsystem consists of two instrumentation batteries, two pyro-batteries, two logic batteries, a power control box, and a junction box. The instrumentation batteries are 120 ampere/hour units and the pyro-batteries are five ampere/hour units.

Service Module Plus Insert - The boilerplate service module is a cylindrical aluminum structure 154 inches in diameter and 141 inches long. An exterior nonstructural fairing, about 11 inches long, between the command module and the service module houses a separation mechanism, support structure for distribution of basic loads imposed by the command module on the service module and fixed umbilical connections between the two modules. The length of the service module, including the fairing, is 152 inches. The length of the boilerplate service module is extended to simulate airframe configuration by an aluminum insert, 52 inches long, which is attached to the spacecraft adapter. The total length of the service module, the command module/service module fairings and the insert is 204 inches.

Spacecraft Adapter - The spacecraft adapter is a cylindrical aluminum structure attached to the instrument unit with bolts. The adapter is 154 inches in diameter and 92 inches long. Within it are the measurement sensors and wiring connecting the spacecraft and rocket.

VEHICLE DESCRIPTION AND BACKGROUND

Elements of the SA-7 are the S-I first stage, S-IV second stage, an instrument unit and a boilerplate Apollo spacecraft. The Apollo type payload, with an active prototype launch escape system, is being flown for the second time.

This two-stage vehicle can place into low Earth orbit more than 20,000 pounds of useful payload. The total weight to be orbited by SA-7 is much greater because all the vehicle except the booster goes into orbit.

Background - The Saturn I program grew out of studies made in 1957 by a group headed by Wernher von Braun. Initial study objective was to demonstrate with ground tests the feasibility of building a large rocket using a cluster of small, available engines. Within little more than a year, a flight program, including the development of high-energy upper stages, was started.

The Saturn I program has led to the development of two larger space vehicles, the Saturn IB and Saturn V. The Saturn I, with its limited capabilities in the Moon program, will not be used for manned Apollo flights. In October 1963, NASA cancelled four manned flights previously assigned to Saturn I.

Saturn IB uses essentially the same first stage as the Saturn I, with up-rated H-1 engines. For its second stage, it uses the 200,000-pound-thrust S-IVB, originally scheduled for use only as the third stage of the Saturn V Moon rocket. Its use on Saturn IB increases payload capability by 50 per cent.

The Saturn I program will end with the 10th flight. Missions of the remaining three vehicles will be to contribute to development of the Saturn IB and Saturn V; to launch unmanned Apollo boilerplate command and service modules; and to place into Earth orbit large satellites to detect the presence and size of meteoroids in near space.

S-I STAGE DESCRIPTION -- SA-7's first stage, the S-I, is a 1.5-million-pound-thrust booster 21-1/2 feet in diameter and 80 feet long.

Eight H-1 engines burning liquid oxygen and kerosene (RP-1), each developing 188,000 pounds thrust, are mounted in the boattail area to give the stage a thrust of 1,504,000 pounds.

In the first four Saturn I launches, the H-1 engines were operating at 165,000 pounds thrust, giving the stage a total thrust of only 1.3 million pounds. SA-5 was the first flight test of the propulsion system at its designed rating. The few internal engine changes necessary to increase performance were primarily changes

which increased the flow rate of propellants into the combustion chamber. Rocketdyne, H-1 engine developer, is presently uprating the H-1 to operate at 200,000 pounds thrust.

The four inboard engines are mounted rigidly to the thrust structure, in a square pattern around the vehicle centerline and are canted outward at a three degree angle. The outboard engines (six degree cant angle) are gimbal-mounted to permit positioning for control purposes during first stage powered flight.

Nine tanks feed the H-1 engines. Clustered around a large center tank 105 inches in diameter (Jupiter size) are eight 70 inch diameter (Redstone size) tanks. The center tank and four outer ones contain liquid oxygen and the remaining (alternating) four hold RP-1 fuel. The fuel tanks are pressurized by gaseous nitrogen carried in two spheres atop fuel tanks; the LOX tanks are pressurized by gaseous oxygen obtained by passing LOX through heat exchangers that are part of each engine package.

All Block II vehicle propellant tanks have been lengthened to hold some 100,000 pounds of additional propellants. At liftoff, the stage contains about 600,000 pounds of LOX and 250,000 pounds of RP-1. Each engine uses 737 pounds of propellant per second. The stage consumption per second is 5,900 pounds.

S-I's spider beam area structurally supports the forward end of the stage, adapts the stage to the S-IV stage and transmits thrust to the S-IV. The beam also provides mounting for retro-rockets, film and television cameras, a liquid oxygen/solid oxygen (LOX/SOX) disposal system (for the S-IV engines) and various measuring components.

The LOX/SOX disposal system prevents unintentional detonation of cool-down liquid or solid oxygen, which falls from the thrust chambers of the S-IV stage engines during the chilldown period prior to engine ignition. Gaseous nitrogen is piped from storage tanks through six dispersal manifold rings into the RL-10 thrust chamber areas. This gas keeps the LOX from freezing during chill-down and allows gaseous oxygen to escape into the atmosphere.

Eight tail fins (four large and four stubs) on the S-I provide support and hold-down points for launch and increase aerodynamic stability during flight. Span of the large fins is about 40 feet.

Eight S-I stages were assembled and tested by the Marshall Center. The other two, S-I-8 and S-I-10, and all first stages for the Saturn IB are being produced by the Chrysler Corp., at Marshall's Michoud Operations, New Orleans.

SA-7's first stage was assembled, checked out and static fired at Marshall before being shipped to Cape Kennedy for erection, mating to the upper portions, and launch.

S-IV SECOND STAGE -- The S-IV stage is powered by six Pratt and Whitney RL-10A3 engines developing a total of 90,000 pounds thrust. The engines burn liquid hydrogen and liquid oxygen, a high-energy combination which produces more than one-third more thrust per pound of propellants than conventional fuels.

S-IV is 18-1/2 feet in diameter, 41-1/2 feet long and weighs some 14,000 pounds empty. It carries about 100,000 pounds of propellant for about eight minutes of propelled flight. Douglas Aircraft Co. manufactures the stage at Santa Monica, Calif., and tests it at Sacramento.

The S-IV is a self-supporting structure designed to permit ground handling without pressurization. Basically, it is a two-section tank structure with an insulated common bulkhead dividing it into a forward LH₂ tank and an aft LOX tank.

Unusual techniques used in the S-IV stage include the common bulkhead, internal insulation in the LH₂ tank, a helium heater, storing helium gas in titanium bottles immersed in the LH₂ fuel and a new system to control propellant use.

The common bulkhead is made by bonding fiberglass honeycomb between two aluminum domes to form a rigid "sandwich." The bulkhead minimizes heat losses from the LOX (-297 degrees F) to the LH₂ (-423 degrees F).

The extremely low boiling point of LH₂ requires that the fuel tank be insulated to minimize loss through boil-off. Inside surfaces of the LH₂ container have insulation bonded to the walls.

Helium gas which pressurizes the LOX tank during flight is stored at LH₂ temperature to save weight. Also, the titanium bottles have improved material properties at this low temperature. The helium is passed through the helium heater to heat and expand it before introducing it into the LOX tank.

The helium heater was tested on SA-5 and SA-6. An extra helium supply system, weighing about 1,000 pounds, was added to the stage as a backup in case of heater malfunction. With heater performance verified, the extra system has been removed from SA-7 and subsequent vehicles.

The RL-10 engine is the country's pioneer LH₂ power plant. Its design was begun by Pratt and Whitney Division of United Aircraft Corp. in 1958. Although it underwent its first in-space operation only late in 1963, ground testing to an unusual degree has shown it to be a reliable engine. The engines functioned well in Saturn flights SA-5 and SA-6.

The RL-10 resembles other engines externally but internally it contains many advances. Most rocket engines use propellant-burning gas generators to drive the pumps which feed propellants to the thrust chambers.

The RL-10 eliminates this cycle. LH_2 from the pump enters the cooling jacket surrounding the thrust chamber to cool the engine. Combustion temperature inside the chamber is 6000 degrees F. While cooling the engine, the hydrogen is heated and converted to very cold gas. The gas is then passed through a venturi and expanded to drive the turbine which furnishes power to pump more LH_2 into the combustion chamber's cooling jacket. The turbine also furnishes power to pump the LOX.

S-IV's six engines, mounted on the thrust structure and canted six degrees outward from the vehicle's centerline, can be gimballed through about four degrees in response to signals from the guidance and control system.

Instrument Unit -- The SA-7 vehicle's stability is maintained and its flight path altered by changing the thrust direction of the S-I's four outboard engines or the six engines of the S-IV. Commands for engine gimbaling and inflight sequencing of vehicle systems originate in the instrument unit (IU).

The IU, located between the S-IV and the payload, has five temperature and pressure controlled areas for environmental control of the electrical/electronic equipment. Its overall height is about 91 inches with an outside fairing 58 inches high. The 154-inch diameter unit weighs some 5,400 pounds.

The IU houses the vehicle guidance and control system, seven tracking subsystems, four telemetry subsystems, the power supply and distribution system, the cooling system and the gaseous nitrogen air bearing supply system.

Four 40-inch diameter tubes arranged at 90 degrees around a vertical 70-inch diameter hub make up the environmentally-controlled portions of the IU. Most of the instruments are housed within the five tubes. The antennas, horizon sensors and the umbilical panel for use in ground checkout and servicing are on the outside skin. The liquid nitrogen cooling system is attached to the inside of the structure.

SA-7's guidance and control system will not adhere to a predetermined trajectory in the pitch plane but will adapt itself to flight conditions. The system consists of the ST-124 stabilized platform, the platform electronic box, guidance signal processor, digital computer, control computer, control sensors and engine gimbaling actuators.

On SA-7, the "closed loop" guidance function is provided by the combination of the above components. The ST-90 stabilized platform used on previous Saturn I flights is no longer used. The new system will provide the timed tilt program and roll maneuver during S-I flight. The guidance system will introduce signals to steer the S-IV/Apollo into orbit.

The IU also has two accelerometers which are used to measure the vehicle's lateral movement in the pitch and yaw planes during the part of S-I flight when significant aerodynamic forces exist. This is to bias the vehicle into the wind direction and reduce engine swivel angle and angle-of-attack, thereby reducing structural loading. These devices were first used on SA-4, replacing the local angle-of-attack meters used previously.

Several other systems flown on SA-4, SA-5, and SA-6 are being tested again, including a radar altimeter and a Q-ball transducer.

Seven on-board tracking systems will include subsystems that are used in determining trajectory for range safety purposes and for vehicle performance evaluation.

Two of four telemetry systems housed in the IU are paralleled with a tape recorder which will record signals during S-I/S-IV separation for later transmission to ground stations in addition to the usual transmission to ground stations.

SA-7 Transportation -- All major sections of the SA-7 vehicle arrived at Cape Kennedy in June. The booster and IU made the 2,000 mile trip to the Cape aboard the Marshall Center barge "Promise." The S-IV stage was flown from the Douglas test facility at Sacramento, Calif., aboard a modified Stratocruiser known as the "Pregnant Guppy."

The Apollo spacecraft boilerplate, complete with launch escape system and related ground service equipment and insert/adapter, was flown to Florida aboard the "Guppy" and Air Force planes from the plant of North American Aviation, Inc., Downey, Calif.

LAUNCHING THE SA-7

SA-7 will be launched from Pad B Complex 37, marking the third time the pad has been used in a Saturn I launching. It was first used for the launch of SA-5 on Jan. 29, 1964.

The 120-acre launch facility has two launch pads, designated A and B, located 1,200 feet apart. Each pad has its own umbilical tower, launch pedestal and automatic ground control station. Both are served by a common launch control center and 328-foot tall, 10 million pound service structure.

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The launch control center is 1,000 feet away from the pads. About 250 persons will be in the launch control center during the launch. Included will be personnel of the Kennedy Space Center, the Marshall Space Flight Center, the Manned Spacecraft Center and contractor personnel.

The SA-7 will be launched from a pedestal 47 feet square which has in its center a 12-sided, 32-foot-diameter ring to allow the escape of rocket exhaust during launch.

Complex 37 has a complete fuel storage and transfer system for both liquid oxygen/RP-1 engines and liquid oxygen/liquid hydrogen engines.

Other facilities on the complex include a 125,000-gallon fuel storage unit; a 28,000-gallon RP-1 replenishing tank and a 125,000-gallon liquid hydrogen storage tank.

Launch Preparations - The first stage of the SA-7 arrived at Cape Kennedy June 7 and was erected June 9. The second stage arrived June 12 and was erected June 19. The Apollo spacecraft, whose components were shipped to the Cape over a period of several days, was mated with the rocket June 26.

Early preparation of the integrated launch vehicle include radio frequency tests, a full-scale simulated flight test, and tanking tests. The S-I is scheduled to be loaded with RP-1 fuel on T-2 days.

The countdown for SA-7 will begin on T-1 day and will be about 17 hours, 15 minutes long. The first part of the count will be about 8 hours, the second part, 9 hours plus.

The final phase of the countdown begins at T-70 minutes and includes:

T-35 minutes -- liquid hydrogen loading S-IV complete
T-25 minutes -- radio frequency systems on
T-24 minutes -- telemeters on
T-20 minutes -- C-Band, Mistran and ODOP on
T-15 minutes -- Range Safety command transmitter on
T-13 minutes -- final phase internal power test begins
T-10 minutes -- telemetry calibration
T- 5 minutes -- ignition arming on
T- 4 minutes -- Range clearance
T- 3 minutes -- arm destruct system
T- 2 minutes, 33 seconds -- firing command, automatic
sequence begins
T- 3 seconds -- ignition
T- 0 Lift-off

-End-